

Patent  
Attorney's Docket No. 032566-018

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
Otto Z. Zhou et al.	)	Group Art Unit: 1753
Application No.: 09/996,695	)	Examiner: Kishor Mayekar
Filed: November 30, 2001	)	Confirmation No.: 1828
For: DEPOSITION METHOD FOR	)	
NANOSTRUCTURE MATERIALS	)	
	)	
	)	
	)	

DECLARATION UNDER 37 C.F.R. § 1.131

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

I, Otto Z. ZHOU, declare that:

1. I am a citizen of the United States of America.
2. I am a co-inventor of the invention disclosed and claimed in the United States Patent Application No. 09/996,695, filed under 35 U.S.C. § 111 on November 30, 2001, entitled "DEPOSITION METHOD FOR NANOSTRUCTURE MATERIALS."
3. I have reviewed U.S. Patent Application Publication No. 2003/0044519 A1 by *Takai*, and b) Affoune et al., *Electrophoretic Deposition of Nanosized Diamond Particles*, *Langmuir* 2001, 17, 547-551. Both *Takai* and *Affoune* are cited in the USPTO communication dated September 20, 2004, in the above-named U.S. Patent Application No. 09/996,695.
4. The material in this declaration is presented to establish reduction to practice from a date prior to the effective date as prior art of a) U.S. Patent Application Publication No. 2003/0044519 A1 by *Takai*, and b) *Affoune* et al.,

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Electrophoretic Deposition of Nanosized Diamond Particles, *Langmuir* 2001, 17, 547-551.

5. I hereby declare that the invention of the claims rejected by the Takai reference and the Affoune et al. reference was conceived and reduced to practice in the United States prior to the critical date of either the Takai reference, e.g., June 14, 2001, or the Affoune et al. reference, e.g., December 28, 2000.

6. Attached Exhibit A is a redacted copy of pages of a laboratory notebook of co-inventor B. Gao. These pages document experimental results from an experiment performed before the critical date of either the Takai reference or the Affoune et al. reference.

7. Exhibit A includes three experiments labeled as 1, 2 and 3. As an example, Experiment 3 describes the electrophoretic deposition of single wall carbon nanotubes (SWNT) from a solution with an addition of charger. The SWNTs were deposited on three different substrates (annotated as A, B and C) by the application of 10 V/cm at 60 mA followed by a constant 60 mA. As noted on the notebook page, the experimenter concluded that the electrophoretic deposition (EPD) works for SWNT.

8. I hereby declare that all statements made herein of my own knowledge are true and that all statements made upon information and belief are believed to be true; and further that these statements and the like so made are punishable by fine or imprisonment, or both, under 18 United States Code section 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

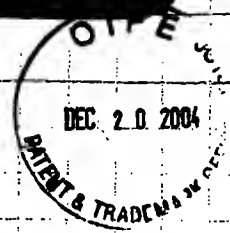


Otto Z. ZHOU

Date: 12/16/2004

## Electrophoretic deposition of SWNTs

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### ① Test of silica (7nm particle size)

disperse silica in methanol ultrasonic for  $\geq 3$  hrs.  
concentration about 1 small sample jar + 100 ml methanol  
\* using Si wafer as two electrode

\* voltage about 10V/cm

\* current only about 0.1 mA.

\* deposit for over night

not good deposition. Only at wafer edge have  
big chunks of silica.

### ② Change Si wafer to Cu foil.

add two ~ 3 drops of Wach (concentrated)

\* voltage about 10V/cm

\* current  $\uparrow$  greatly.

using constant current 10 mA for 2 ~ 3 minutes.

get pretty uniform film but film peeled off  
quickly after methanol dry.

### ③ electrophoretic deposition of SWNT.

$\left\{ \begin{array}{l} 18 \text{ mg SWNT (Raw before purification)} \\ 150 \text{ ml} \\ 2 \sim 3 \text{ drops of methanol} \\ \text{NaOH} \end{array} \right.$

\*  $10 \text{ V/cm}$

\*  $60 \text{ mA}$

then switch to constant current  $60 \text{ mA}$  for  $2 \sim 3$  minutes

A. Cu foil not good - greenish color film

编号: 0211201

B. Stainless Steel black film but yellowish a little  
should be SWNT.

编号: 0211202

C. Si wafer black film - but current  $\downarrow$  pretty quick  
from  $60 \text{ mA}$  (if constant current mode), film form in  
minutes

编号: 0211203

Before add NaOH, current very low at same voltage

EPD works for SWNT but film not so good, not uniform  
not good suspension

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